

Matrix Logic

Logic is a thought process which follows some type of reasoning. The thinking may be valid or invalid. It may be based on facts or assumptions. As a result, the logic may result in true or faulty conclusions. One of the objectives of this course is to help the students think with valid logic and draw true conclusions.

Deductive reasoning can be used in problem solving situations. One method of solving problems uses a table. This method is called matrix logic.

The definition of a matrix is a rectangular arrangement of numbers in rows and columns. For purpose of matrix logic, those rows and columns should have headings. Matrix logic is the use of a matrix to solve a logic problem.

Use logic to solve the problem below.

Six students attended a class party and ate a variety of foods. Something caused them to become ill. John Q. Public ate pizza, hamburgers, and tacos and became ill. Homer T. Odyssey ate hamburgers and tacos but not pizza. He became ill. L.J.Horner ate pizza but neither hamburgers nor tacos and felt fine. L.B. Peep didn't eat anything and also felt fine. J.Spratt ate pizza and tacos but no hamburgers and became ill. James T. Kirk ate hamburgers and tacos but stayed away from the pizza. He also got sick.

Make a table to organize your information. You might use the heading given below for your table. Then determine the food that probably caused the illness.

Name	Ate hamburgers?	Ate pizza?	Ate tacos?	Became ill?

Solve the matrix logic problems on the back of this paper. Number 2 has been done for you as an example.

LOGIC PROBLEMS

The following problems can be solved by eliminating possibilities. It may be helpful to use charts such as the one shown in the first problem. Mark an X in the chart to eliminate a possible answer.

Solve each problem.

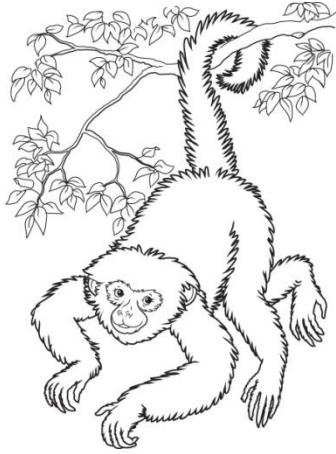
1. Nancy, Olivia, Mario, and Kenji each have one piece of fruit in their school lunch. They have a peach, an orange, a banana, and an apple. Mario does not have a peach or a banana. Olivia and Mario just came from class with the student who has an apple. Kenji and Nancy are sitting next to the student who has a banana. Nancy does not have a peach. Which student has each piece of fruit?

	Nancy	Olivia	Mario	Kenji
Peach				
Orange				
Banana				
Apple				

2. Victor, Leon, Kasha, and Sheri each play one instrument. They play the viola, clarinet, trumpet, and flute. Sheri does not play the flute. Kasha lives near the student who plays the flute and the one who plays trumpet. Leon does not play a brass or wind instrument. Which student plays each instrument?

	Viola	Clarinet	Trumpet	Flute
Victor				
Leon				
Kasha				
Sheri				

3. Mr. Guthrie, Mrs. Hakoi, Mr. Mirza, and Mrs. Riva have jobs of doctor, accountant, teacher, and office manager. Mr. Mirza lives near the doctor and the teacher. Mrs. Riva is not the doctor or the office manager. Mrs. Hakoi is not the accountant or the office manager. Mr. Guthrie went to lunch with the doctor. Mrs. Riva's son is a high school student and is only seven years younger than his algebra teacher. Which person has each occupation?
4. Yvette, Lana, Boris, and Scott each have a dog. The breeds are collie, beagle, poodle, and terrier. Yvette and Boris walked to the library with the student who has a collie. Boris does not have a poodle or terrier. Scott does not have a collie. Yvette is in math class with the student who has a terrier. Which student has each breed of dog?



Matrix Practice-

Determining answers for more than two variables.

Mrs. Robinson's 4th grade class took a field trip to the local zoo. The day was sunny and warm- a perfect day to spend at the zoo. The kids had a great time and the monkeys were voted the class favorite animal. The zoo had four monkeys- two males and two females. It was lunchtime for the monkeys and as the kids watched, each one ate a different fruit in their favorite resting place. Can you determine the name of each monkey, what kind of fruit each monkey ate, and where their favorite resting place was?

- Sam, who does not like bananas, likes sitting on the grass
- The monkey who sat on the rock ate the apple
- The monkey who ate the pear didn't sit on the tree branch.
- Anna sat by the stream but she didn't eat the pear.
- Harriet didn't sit on the tree branch.
- Mike doesn't like oranges.

1. Jeff, Kim, Hans, and Lou each have a different pet: a dog, a turtle, a parrot, and a snake. Jeff is teaching his pet to speak. Kim's pet has four legs. Hans pet has no legs. Lou's pet has more legs than Jeff's pet but no fur. Who owns the dog?

2. Alexis, Bianca, Charlene, and Daphne all have different birthdays in the same month. Their birthdays are on the 13th, 14th, 16th, and 17th.
- Alexis's birthday is an even number
 - Bianca's birthday is 2 more than Alexis's birthday
 - Daphne's birthday is a prime number
 - Charlene's birthday is a factor of 182

Which date is Charlene's birthday?

3. Quincy, Rita, Sheila, and Theo all parked their cars next to each other in the school parking lot. The cars each have a different color: blue, green, red, and white.
- The blue car is between Quincy's car and the green car
 - Rita parked her car next to the green car
 - Theo owns the red car which is parked next to Sheila's car.

Based on the statements above, who has the blue car?

4. John is taller than Sue, and Sue is shorter than Ted who is taller than Bob. These people are standing in line from shortest to tallest. Which one of the following arrangements could NOT happen?
- A. Bob, Sue, Joh, Ted
 - B. Sue, Bob, John, Ted
 - C. Bob, John, Sue, Ted
 - D. Sue, Bob, Ted, John
5. Todd, Bill, and Jeff play 1st, 2nd, and 3rd base at the University of Arkansas at Monticello, but not necessarily in that order.
- Todd does not play 2nd base.
 - Bill is majoring in business.
 - The 1st baseman lives in the dorm.
 - The 3rd baseman is majoring in communications.
 - Todd and Bill share an apartment.
6. All students at Riverside High School who are in the choir also take drama. Jeremy is a drama student at Riverside High School. What else can we conclude about him?
- A. Jeremy is a senior.
 - B. Jeremy does well in drama.
 - C. Jeremy is in the choir.
 - D. There is nothing else that we know about Jeremy.

Tyrone, Karl, and Luke bought gifts for each other. The gifts were a CD, a cap, and a t-shirt. Determine who bought each gift and who received each gift, based on the following statements.

1. No person bought a gift for himself.
2. Karl received a t-shirt.
3. Luke did not give a gift to Tyrone.
4. The person who gave a gift to Luke received the CD.

Show all of your work and explain the details of your reasoning. You may use a table or matrix in your explanation.

Birth Month Logic Puzzle

Four children have different birth months, but were all born in the same year. Find out who was born in each month.

	January	February	March	April
Amy				
Bob				
Cal				
Deb				

1. Cal was born before Deb.
2. Deb was born two months after Bob.
3. Bob was born after Amy but before Cal.

Roommates

Five roommates met last Wednesday to celebrate Louis' birthday, another mutual friend. During the birthday festivities, the roommates ended up in a cheerful debate about how best to travel in the traffic-clogged city. While many creative suggestions were offered by other birthday guests, the roommates decided to try a little test on their way home that evening. Each would use a different mode of transportation to get back home. Since their departure and arrival destinations were the same, it would be a good test of actual transportation times. Determine the full name of each roommate, the mode of transportation each chose for the return trip home, and how long it took each of them to arrive (20 to 40 minutes).

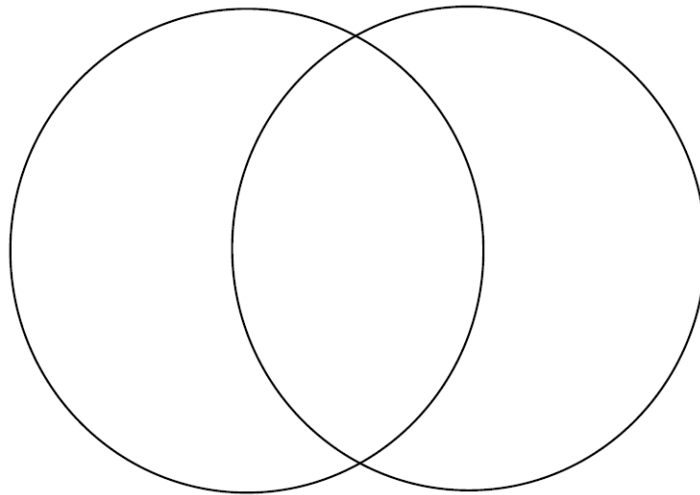
1. Ed didn't use the bus. Mr. Sullivan's first name was Chris.
2. Mr. Manning spent ten minutes longer to arrive home than it took Clyde but he was back five minutes faster than the roommate who took the bus.
3. The roommate who walked spent 20 minutes getting home. Earl came home in a car.
4. David didn't use the subway to get home but he arrived five minutes before Mr. Park, whose first name wasn't Ed.
5. Mr. Stewart arrived home in 30 minutes.
6. The roommate who used a bicycle returned ten minutes earlier than Earl but his last name wasn't Pennant.

[illegible]

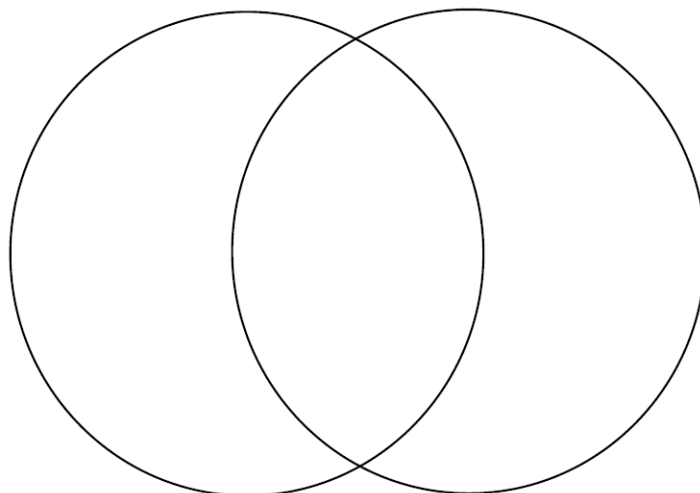
Venn Diagram Practice

Fine Art Students

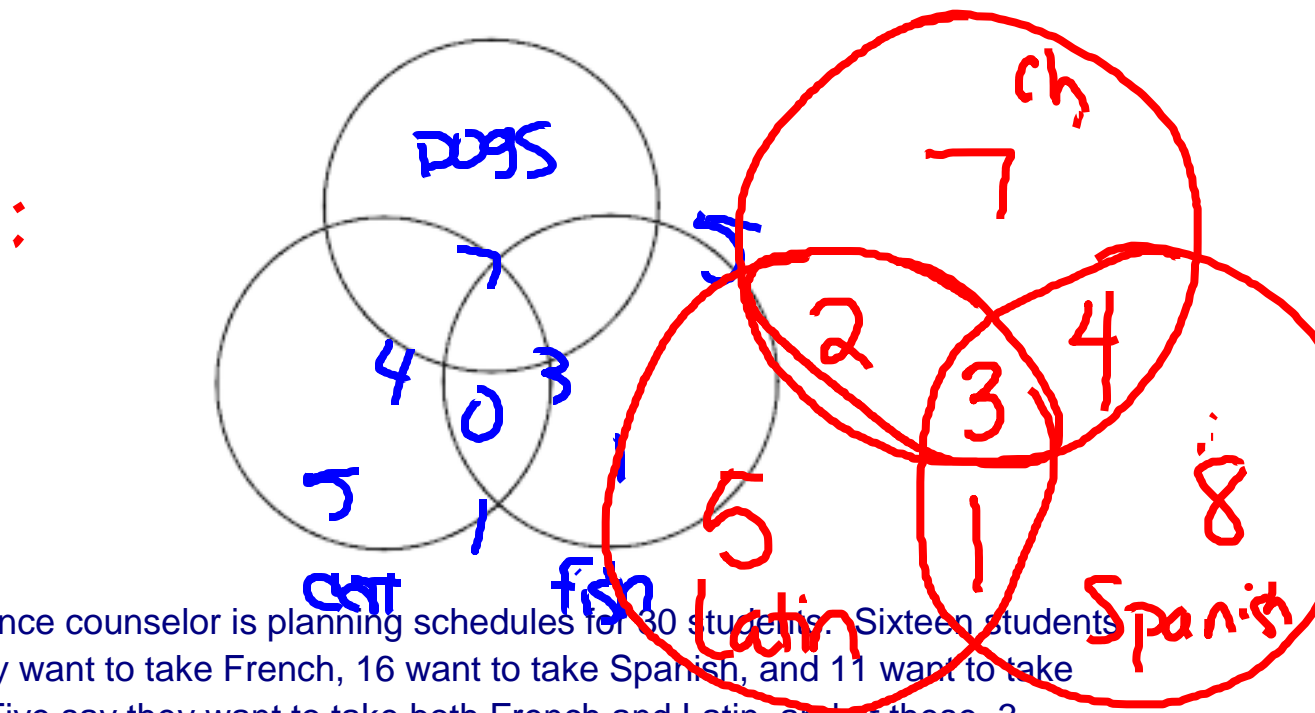
In a class of 50 students, 18 take Chorus, 26 take Band, and 2 take both Chorus and Band. How many students in the class are not enrolled in either Chorus or Band?



In a school of 320 students, 85 students are in the band, 200 students are on sports teams, and 60 students participate in both activities. How many students are involved in either band or sports?



A veterinarian surveys 26 of his patrons. He discovers that 14 have dogs, 10 have cats, and 5 have fish. Four have dogs and cats, 3 have dogs and fish, and one has a cat and fish. If no one has all three kinds of pets, how many patrons have none of these pets?



A guidance counselor is planning schedules for 30 students. Sixteen students say they want to take French, 16 want to take Spanish, and 11 want to take Latin. Five say they want to take both French and Latin, and of these, 3 wanted to take Spanish as well. Five want only Latin, and 8 want only Spanish. How many students want French only?

